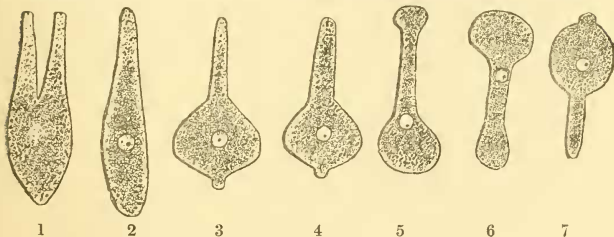


JOTTINGS FROM THE BIOLOGICAL LABORATORY  
OF SYDNEY UNIVERSITY.

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NO. 16. NOTE ON THE OCCURRENCE OF A FLAGELLATE INFUSORIAN AS AN INTRA-CELLULAR PARASITE.

In an undescribed Rhabdocœle Turbellarian found in water obtained from a pond in the Victoria Park, Sydney, a remarkable phenomenon was observed. All the specimens examined had a dull yellowish-green colour, and, when they were examined under the compressorium, the colour was found to be due to the presence of innumerable, actively-moving, parasitic organisms. These were situated in the interior of the unicellular glands or other



large cells in the parenchyma—a very large proportion of these cells being thus infested. When, by dint of crushing the Turbellarian, the parasites were set free from the interior of the cells, their form and movements could be more readily observed. In shape they were nearly always constantly varying with great rapidity between an extreme of elongation and an extreme of

contraction. When in a quiescent condition they had the form represented in figure 2—approximately cylindrical, sharply pointed at one—the anterior—end, less sharply at the other; in length they were  $\cdot 005$  mm. and in greatest breadth  $\cdot 002$  mm. In many cases a series of movements, successive phases in which are represented in figures 3 to 7, followed one another in rapid succession. A glance at the figures will show that these movements are just the movements which are calculated to force a soft contractile body through such an obstacle as the protoplasmic network of a cell would present,—a narrow process thrust forward to force a passage, a thickening formed at the end of this process, and the main mass of the body drawn forward into this; then a fresh process thrust out in the same direction, and so on. At the same time, especially when the animal was still confined within a cell, there were frequent active twisting movements. In the interior of the mobile protoplasm of the parasite were a good many small rounded and rod-shaped particles of a greenish colour. These were most abundant about the middle, almost completely absent at the anterior extremity. A little behind the middle was a rounded space free from these green particles; this proved, when staining agents were used, to be a rounded nucleus with a distinct nucleolus. At the anterior end was usually a very slight notch. In most cases there was no flagellum; but in a considerable number a flagellum was present and exerted a considerable influence on the movements of the animal.

The movements of the animals within the cells were very remarkable. They seemed rarely to be at rest, almost incessantly creeping actively round and round the interior of the cell. Sometimes they could be distinctly seen to brush aside filaments in the cell-protoplasm, sometimes to thrust on one side the nucleus, restrained always apparently within the interior of the cell by a firm membrane which resisted perforation. Usually there was only one in a cell; frequently there were two, occasionally even three. In several cases they were observed to be undergoing multiplication by fission—the division beginning, as represented in figure 1, at the clearer anterior end.

The Rhabdocœle hosts appeared to be in full vigour and activity, notwithstanding the hundreds of the parasites in incessant movement in the cells. But in one instance the cell containing the parasite contained also a number of actively-moving *Vibriones*, so that in some cases at least a destructive effect would appear to be produced.

The relationship of the parasite to the Euglenoids is unmistakable; and it bears a considerable resemblance to *Euglena deses*, Ehr., the young of which is described as devoid of flagellum and moving by peristaltic contractions.\* But no member of this family, or, so far as I can ascertain, any other group of *Flagellata*, has ever been observed living as an intra-cellular parasite. Pfeiffer in a recent work, "Die Protozoen als Krankheitserreger,"† states: "Aus Klasse I., die Infusorien und Flagellaten umfassend, sind obligate Zellschmarotzer unter den parasitisch lebenden Species noch nicht bekannt." But as far as the *Flagellata* are concerned, the statement would still be correct were the word "obligate" omitted. Several cases of parasitic *Flagellata* are mentioned by Bütschli‡; but these occur in the mucus of various organs, such as the alimentary canal, opening on the exterior, and, in the case of *Trypanosoma* and *Herpetomonas*, in the blood§; none of them inhabit the interior of cells. I think the observation now recorded is of some importance as suggesting a different origin for some at least of the *Sporozoa* than that suggested by Ray Lankester.||

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\* Saville Kent, "Manual of the Infusoria," p. 383, pl. xx. figs. 52 and 53.

† I am indebted to Professor J. T. Wilson for directing my attention to this work.

‡ "Protozoa" of Bronn's 'Thier-Reich,' p. 868.

§ Lewis, 'Q. J. Micro. Sci.,' Vol. xxiv. (1884).

|| Zoological Articles from the 'Encyclopædia Britannica,' "Protozoa," p. 26.